made to photographs of stars taken at different times, the visual absorption at the time should also be calculated. I am not alluding now to the fact that the angle included in any star photograph is small; stars on such a plate may be compared *inter se*; but in order to make comparisons general the atmospheric absorption for the photographically active rays must be studied, and it is absolutely necessary that the spectrum value of the sensitive salt should be known beforehand.

Photographic Search for the Minor Planet Sappho.

By Isaac Roberts.

From 1872 to the present time no observations of the minor planet *Sappho* have been published except those of 1882, in which year Mr. Gill took measures for a determination of the solar parallax.

Mr. Bryant, who is engaged in determining the orbit of this planet, prepared an ephemeris for the opposition of this year, and in order that no time might be lost in identifying it from the neighbouring faint stars, and further that the error of the ephemeris might be obtained as early as possible, he sent, on December 16, 1886, the positions he had calculated, and appealed to me to find the planet if possible by photography.

The brightness of the planet is estimated at eleventh magnitude, and since its orbital movement in sixty minutes is equal to about 4·2 times its photographic diameter, the trail it would leave would probably not exceed in density a thirteenth magnitude star.

On December 30 I obtained, with an exposure of sixty minutes between sidereal time at Maghull, $7^h\ 35^m$ and $8^h\ 35^m$, a negative of which the accompanying photograph marked chart No. 1 is an enlargement to three diameters. The trail of the planet is to be seen near the centre, and to make it more easily recognisable a white circle is drawn round it.

Another photograph was taken on January 1, and a third on the 14th. These are marked respectively charts Nos. 2 and 3. Each of the three charts shows the difficulties to be encountered in finding a planet so faint as this one amongst such numbers of other faint stars, and as an illustration I may refer to chart No. 3 upon which I estimate that there are about 2,000 stars below the seventh magnitude on each square degree.

Mr. Bryant informs me that the error of the ephemeris deduced from the photographs is in very close agreement with that from two meridian observations of the planet made about the same time at Dunecht, results that must be considered satisfactory.

This is probably the first instance in which photography has been successfully applied to the purpose here described, and as an historical fact it may be worth recording. There are also

some inferences which might be drawn from these experiments. First, it is here demonstrated that asteroids of eleventh magnitude leave very strong trails on the films of the photographic plates, and probably others down to the thirteenth or fourteenth magnitude could under favourable atmospheric conditions be photographed.

Another inference is that all the asteroids which up to the present time have been discovered, together with those that may exist but are not recorded down to the fourteenth magnitude, could by one astronomer alone be found and accurately charted in the course of two or three years' time.

On the Orbit of 14 (*i*) *Orionis* (*O. Struve* 98). By J. E. Gore.

I have computed the orbit of this binary star by means of the graphical method, and find the following provisional elements :—

Elements of 14 (*i*) *Orionis.*

$P = 190{\cdot}48$ years	$\Omega = 99^\circ\ 35'$
$T = 1959{\cdot}05$ A.D.	$\lambda = 302^\circ\ 42'$
$e = 0{\cdot}2465$	$a = 1''{\cdot}22$
$\gamma = 44^\circ\ 57'$	$\mu = -1^\circ{\cdot}89$

From these elements we have the following formulæ :—

$$(1)\quad u - 14^\circ{\cdot}12 \sin u = -1^\circ{\cdot}89\,(t - 1959{\cdot}05)$$

$$(2)\quad \tan \tfrac{1}{2}V = 1{\cdot}286 \tan \tfrac{1}{2}u.$$

$$(3)\quad \tan(\theta_c - 99^\circ\ 35') = 0{\cdot}7077 \tan(V + 302^\circ\ 42')$$

$$(4)\quad \rho = 1''{\cdot}22\,(1 - 0{\cdot}2465 \cos u) \cdot \frac{\cos(V + 302^\circ\ 42')}{\cos(\theta_c - 99^\circ\ 35')},$$

where u is the excentric anomaly, and V the true anomaly for the epoch t; θ_c the required position-angle, and ρ the distance.

The following is a comparison between the recorded measures and the positions computed from the above elements :—

Epoch.	Observer.	θ_o	θ_c	$\theta_o - \theta_c$	ρ_o	ρ_c	$\rho_o - \rho_c$
		°	°	°	″	″	″
1844·05	Mädler	258·8	254·44	+4·36	—	1·36	—
1844·53	O. Struve	250·83	253·95	−3·12	1·14	1·35	−0·21
1849·22	„	249·60	248·97	+0·63	0·98	1·33	−0·35
1852·15	Mädler	245·4	245·80	−0·40	—	—	—
1854·82	Dawes	240·9	242·75	−1·85	1·29	1·29	0·00
1859·22	O. Struve	237·80	237·55	+0·25	1·24	1·26	−0·02
1865·98	Dembowski	234·0	228·95	+5·05	1·25	1·20	+0·05